



CERCLAGE WIRING IN SUBTROCHANTERIC FRACTURES

THE GOOD, THE BAD & THE UGLY

Orthopeadica Belgica

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Vestar Antwerpen - Belgium

Dr. Bonnevie Fergus

CHU Liège

BOTA Session



Two teams concerning cerclage wiring...



PRO cerclage wiring

AGAINST cerclage wiring

- Do it whenever your fracture pattern allows it
- Better reduction
- Better biomechanics
- Better patient outcome

- Never do it, whatever happens, due to concern about local biological impairment
- Even if you have to accept a suboptimal reduction...

With cerclage wiring

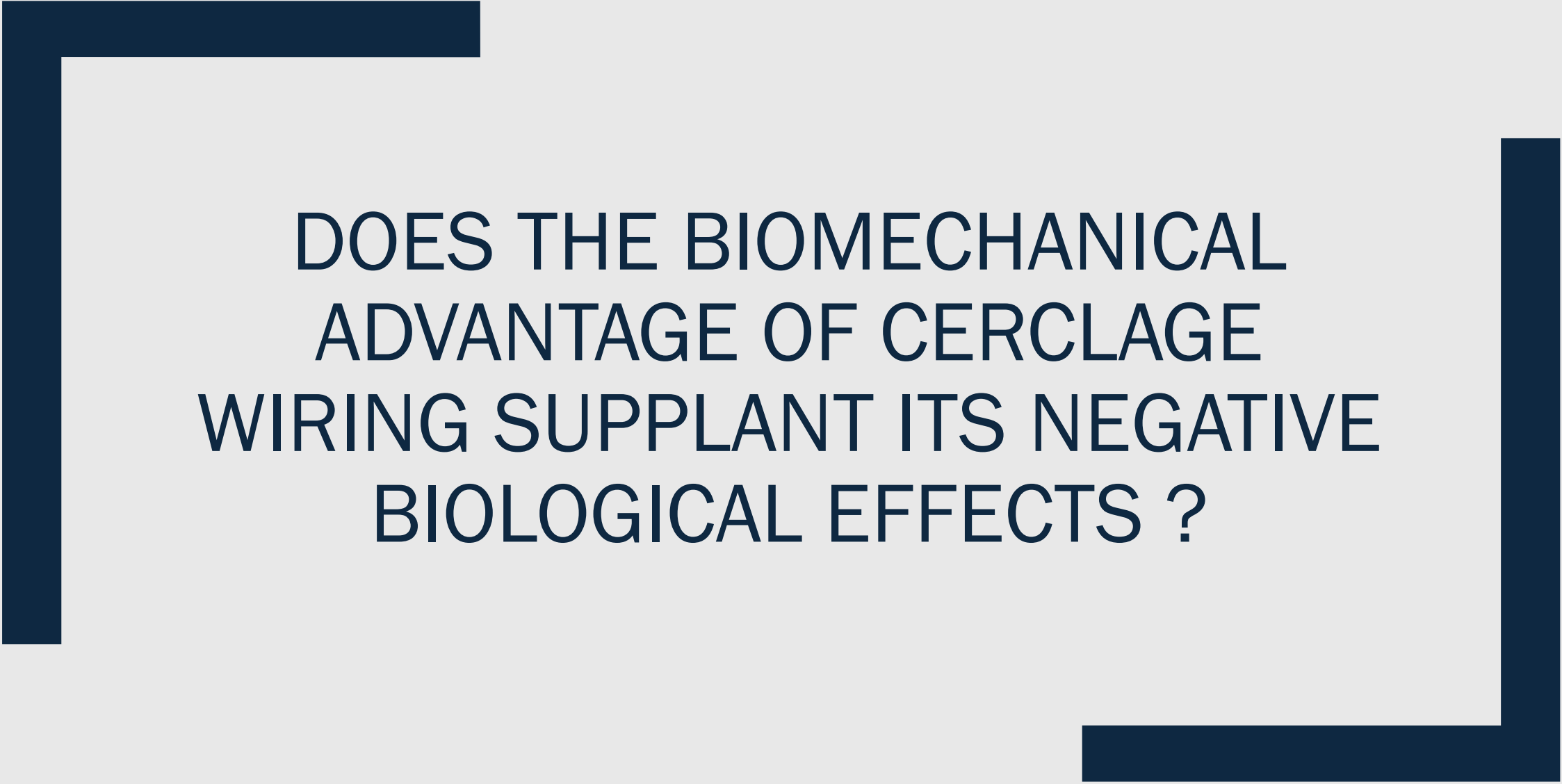


Without cerclage wiring



Without cerclage wiring





DOES THE BIOMECHANICAL
ADVANTAGE OF CERCLAGE
WIRING SUPPLANT ITS NEGATIVE
BIOLOGICAL EFFECTS ?

Negative effects of cerclage wiring ?

- Loss of the benefits of a closed reduction technique
 - Wash-out of the fracture hematoma
 - Diminished local vascularisation due to the direct surgical approach
 - Risk of periosteal stripping and fragment devascularisation during application
- Concerns due to interruption of the periosteal blood supply
- Augmented surgical time & peroperative blood loss
- More wound infections



Concerns about the impact of the cerclage wiring on the local biology !

How to avoid biological impairment ?

➔ **Respect the soft tissues !**

Biological impairment due to :

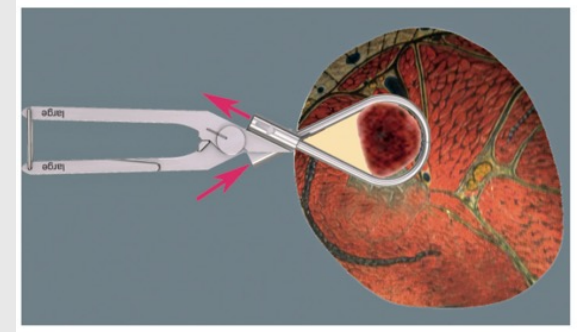
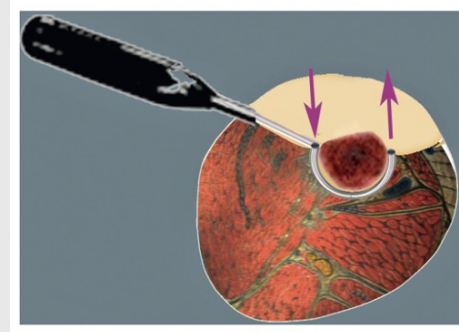
- Passing the cerclage around the bone
- Effect of the pressure of the cerclage on the bone surface



Application of the cerclage wire

- Respect the soft tissues :
 - Limited surgical approach
 - No need for direct visualisation of the fracture
 - Use of « finger tool » & fluoroscopy
 - Well placed percutaneous clamps : Verbrugge, Lowman, Collinear...
 - Manipulation of the traction table to facilitate fracture reduction
 - Advantage of a transvastus approach for minimal invasive techniques

- Minimal invasive wire passer



Periosteal strangulation ?

Cerclage, Evolution and Potential of a Cinderella Technology. An Overview with Reference to Periprosthetic Fractures

Cerkláž, vývoj a možnosti opomíjené techniky. Přehled s přihlédnutím k použití u periprotetických zlomenin

S. M. PERREN¹, A. FERNANDEZ DELL'OCA², M. LENZ³, M. WINDOLF⁴

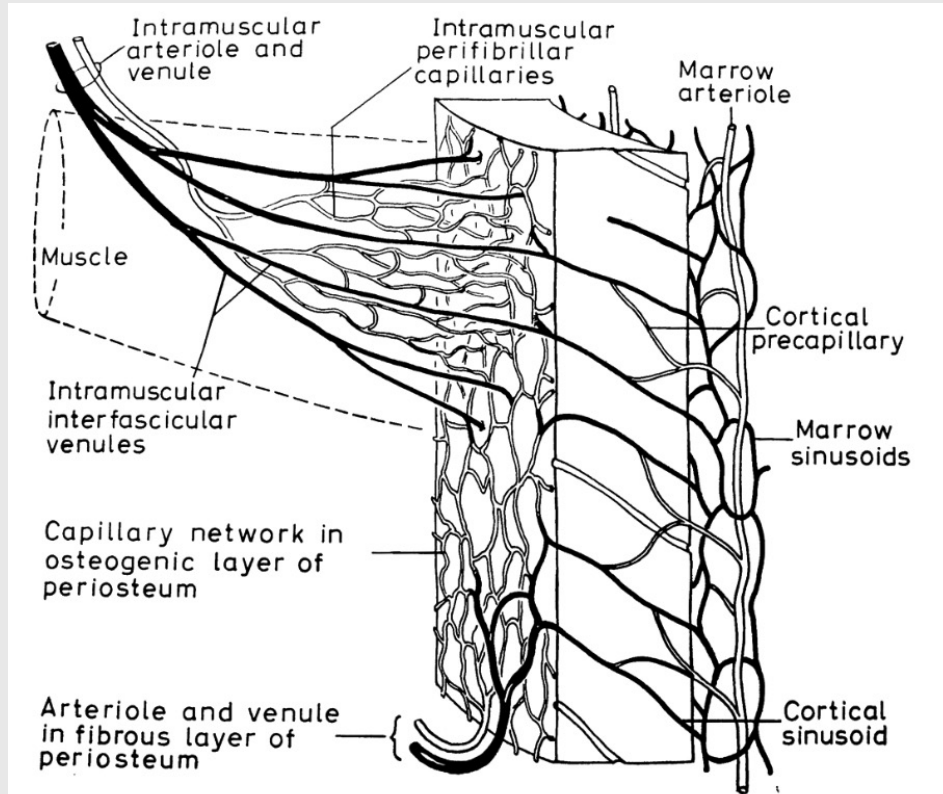


Figure 22. Blood supply to bone according to Brooks (1971) (5). The vessels reach the bone mainly in a centripetal direction and are therefore less sensitive to strangulation by a cerclage loop around the bone. Vascular connection between bone cortex, periosteum and attached muscle.

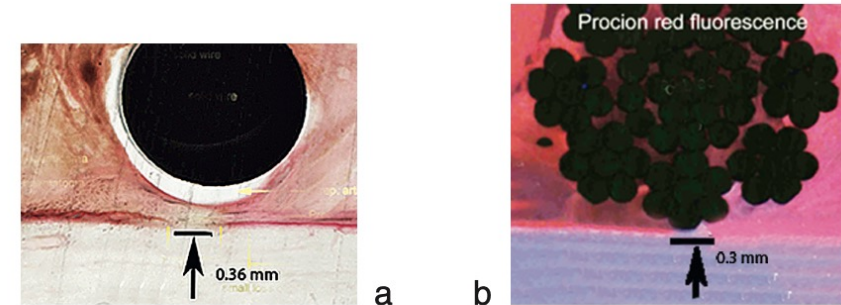


Fig. 23a. Solid wire cerclage. The periosteum exhibits a lack of blood perfusion which is only about 0.36 mm wide. The space immediately near the wire is an artefact from histological preparation but there is a small distance between wire and bone filled with soft tissue suspect of secondary loosening.

Fig. 23b. Cerclage cable in immediate contact to the bone surface with a very small <0.3 mm wide lack of perfusion of the periosteum.

Advantages of cerclage wiring in subtrochanteric fractures ?

- Better **reduction**
- Better **biomechanics**
- Better **patient outcome**

Better reduction

- Avoid varus of the proximal fragment
- Avoid rotational malalignment
- Diminished fracture gap

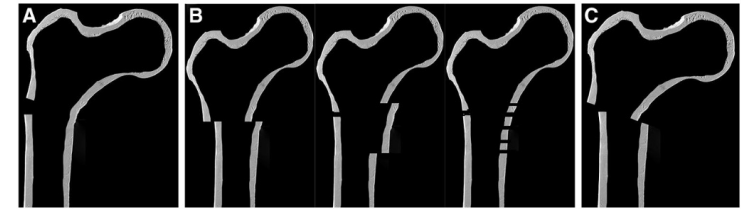
- In some cases : restitution of a cortical medial wall support

- Avoid secondary radial displacement of the fragments
Loose-Lock stability concept (cfr. S. PERREN)

- *Phase 1 : low tension in the wire : free displacement of the fragments*
- *Phase 2 : wire under tension : elastically resisted displacement*

- Facteurs de mauvais pronostic :

- Varus de $>5^\circ$
- Perte du support cortical médial
- « Auto-dynamisation » du clou < 3 mois



(35) Krappinger, D., Wolf, B., Dammerer, D. et al. Risk factors for nonunion after intramedullary nailing of subtrochanteric femoral fractures. Arch Orthop Trauma Surg 139, 769–777 (2019)

The benefit of wire cerclage stabilisation of the medial hinge in intramedullary nailing for the treatment of subtrochanteric femoral fractures: a biomechanical study

Thorben Müller · Tobias Topp · Christian A. Kühne · Gershon Gebhart · Steffen Ruchholtz · Ralph Zettl

Better biomechanics

- Increased stability of the final construct
- Re-establishes medial cortical support
- Loadsharing construct

Increased resistance « en fatigue » of the nail

Reduces risk of construct failure

	Cerclage	Mean value	n	SD	Paired differences	
					Mean value	p
Compressive load (N) at plastic deformation of 5 mm	With	2,330	10	598.2	170	0.2
	Without	2,160	10	653.5		



Axial load tolerance of 5mm plastic deformation is **170N lower** without cerclage wiring

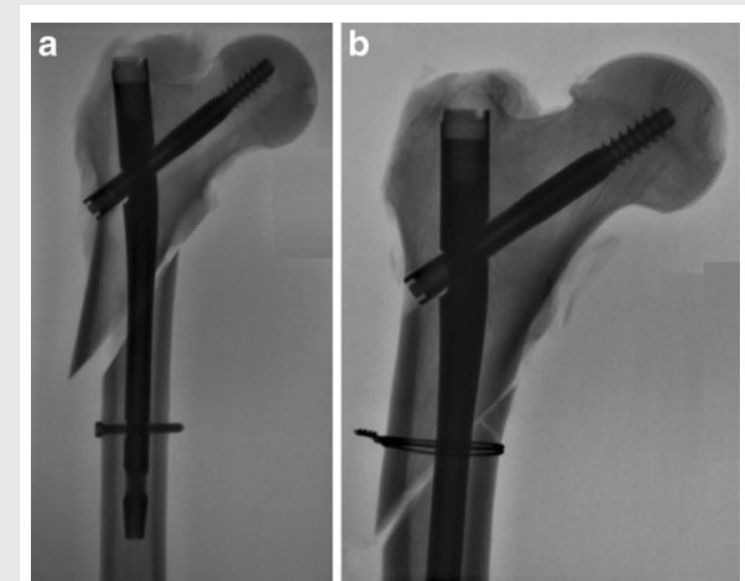


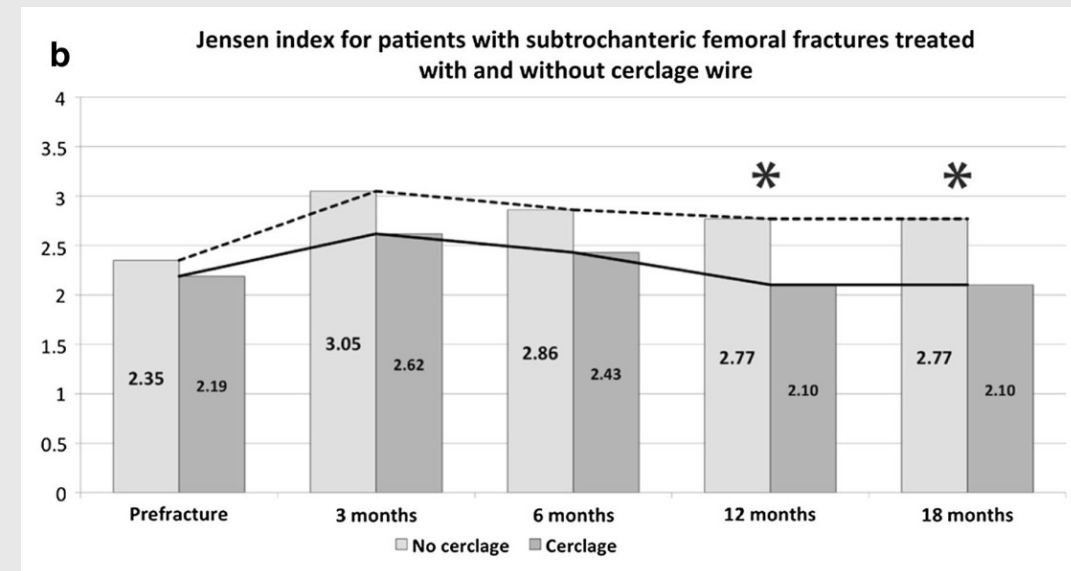
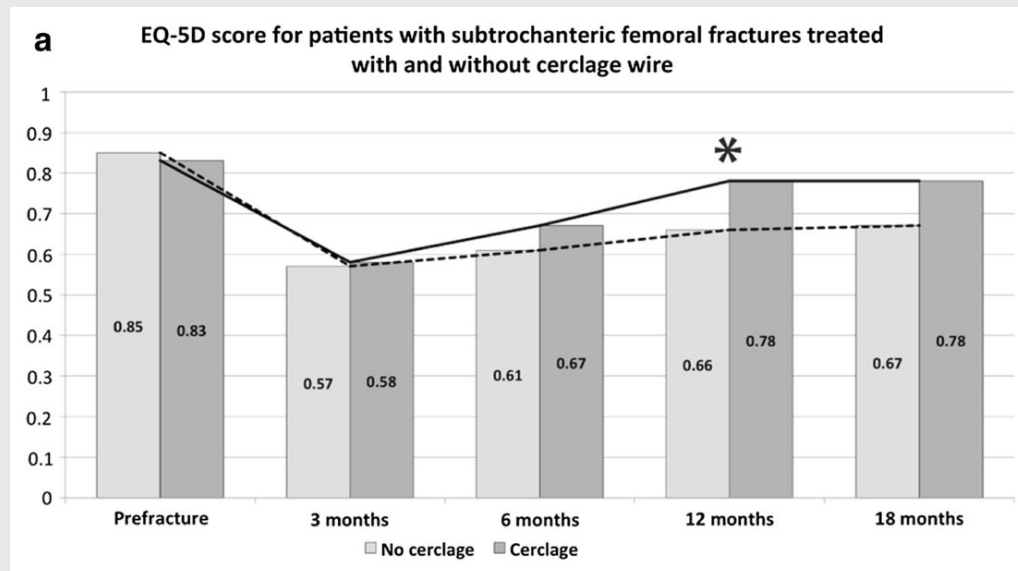
Fig. 5 **a** In group A in nine of ten cases the proximal fragment moved into varus tipping with clear widening of the fracture gap during cyclic loading. **b** In group B, with supplemented cerclage, in seven of ten cases the medial buttress broke above the cerclage; in all cases the osteosynthesis remained without failure

Better patient outcome

- Diminish post-operative pain
- Total post-operative weight-bearing usually allowed
- Ameliorate hip function (short & long-term)
- Shorter hospital stay (mean -2 days)
- Quicker time to union

Subtrochanteric fractures in elderly people treated with intramedullary fixation: quality of life and complications following open reduction and cerclage wiring versus closed reduction

Pablo Codesido¹ · Ana Mejía¹ · Jonathan Riego¹ · Cristina Ojeda-Thies²





WHAT DOES THE LITTERATURE
SAY ?

Litterature :

[Eur J Orthop Surg Traumatol.](#) 2023; 33(4): 739–749.

PMCID: PMC10125946

Published online 2022 Mar 21. doi: [10.1007/s00590-022-03240-z](https://doi.org/10.1007/s00590-022-03240-z)

PMID: [35377073](https://pubmed.ncbi.nlm.nih.gov/35377073/)

The role of cerclage wiring in the management of subtrochanteric and reverse oblique intertrochanteric fractures: a meta-analysis of comparative studies

[Ashraf T. Hantouly](#),¹ [Motasem Salameh](#),² [Ahmad A. Toubasi](#),³ [Loay A. Salman](#),¹ [Osama Alzobi](#),¹ [Abdulaziz F. Ahmed](#),⁴ and [Ghalib Ahmed](#)^{✉1}

■ Patients treated WITH cerclage wiring :



415 patients from 6 studies

- Higher infection rate
- Increased blood loos
- Increased surgical time
- Reduced union time
- No increase in non-unions
- Lower overall complication rate
- Better functional results
- Shorter hospitalisation stay

Meta-Analysis > [Eur J Trauma Emerg Surg.](#) 2022 Dec;48(6):4761-4774.

doi: [10.1007/s00068-022-02003-z](https://doi.org/10.1007/s00068-022-02003-z). Epub 2022 May 26.

The effect of cerclage wiring with intramedullary nail surgery in proximal femoral fracture: a systematic review and meta-analysis

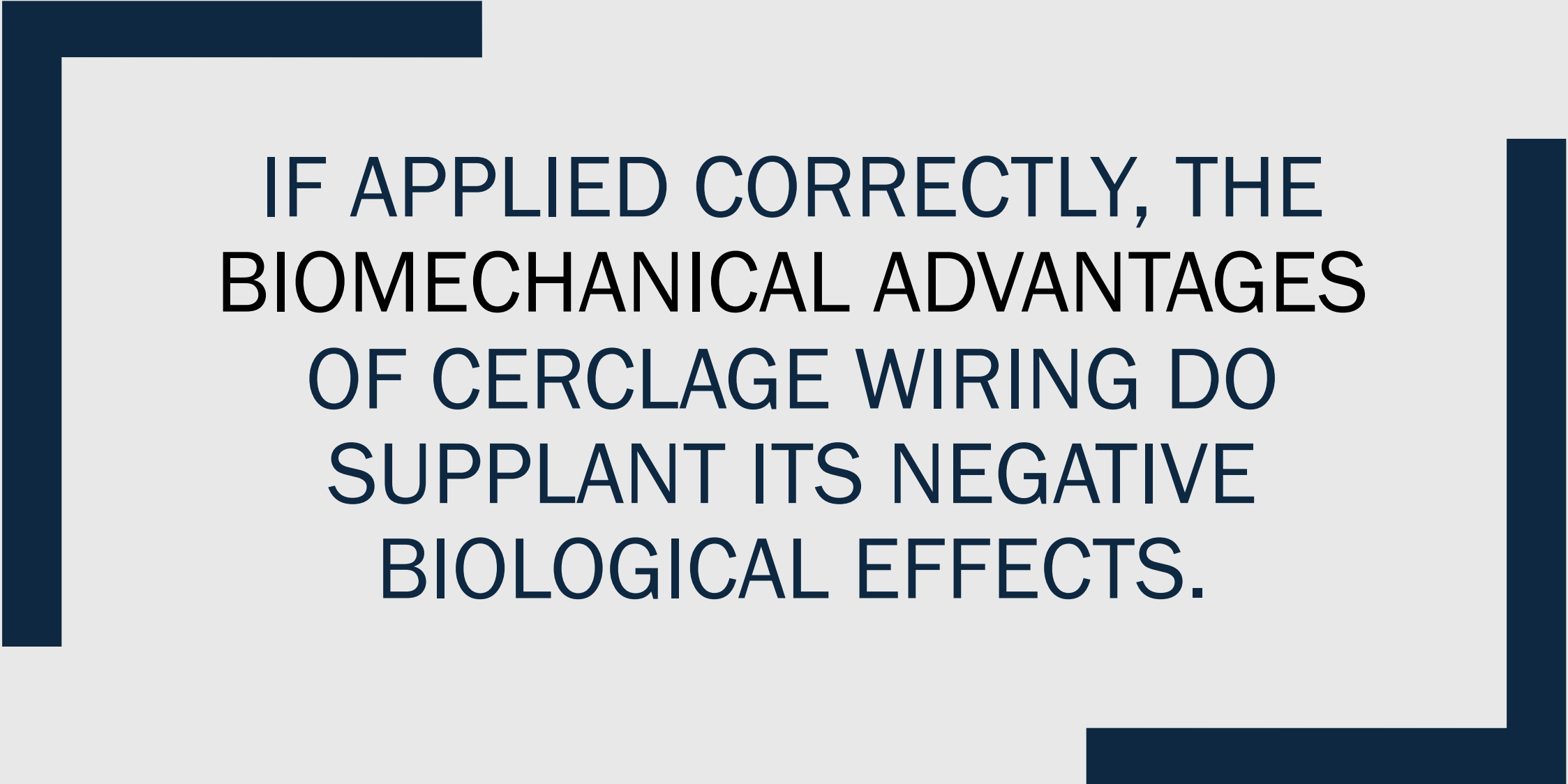
[Chul-Ho Kim](#)¹, [Yong-Cheol Yoon](#)², [Kyu Tae Kang](#)¹



1,718 patients from 14 studies

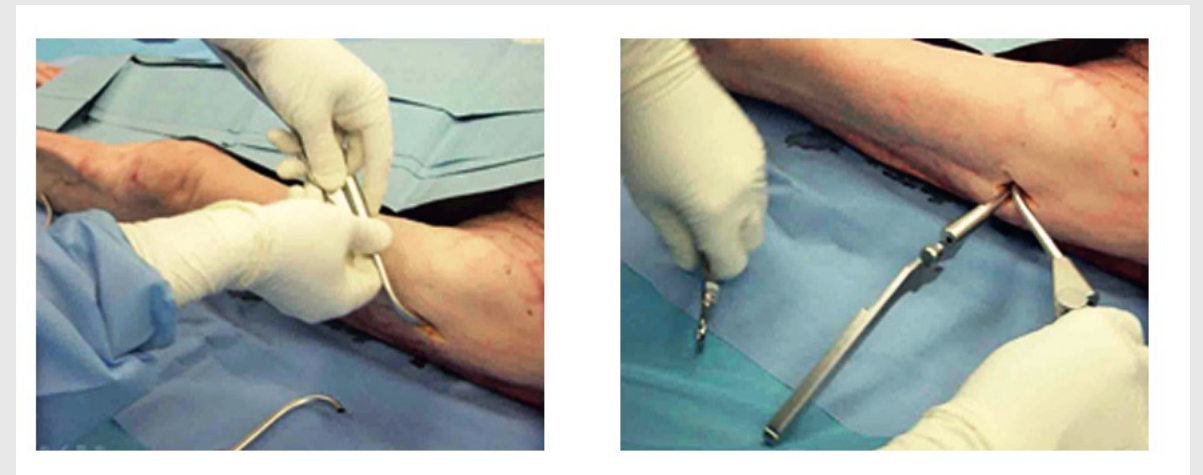
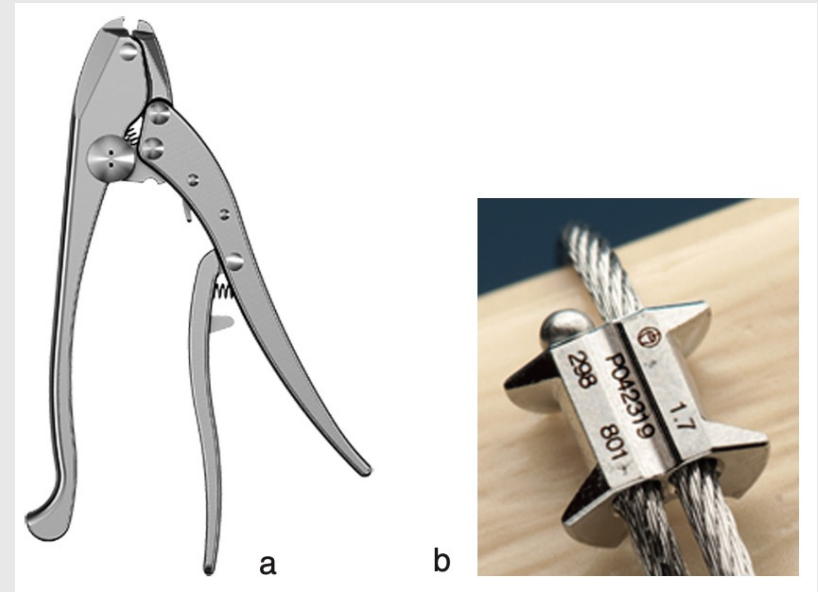
Conclusion

- If applied correctly with particular attention to the soft tissues, the **biological impairment of cerclage wiring is minimal**.
- Cerclage wiring will obtain **more accurate reduction** and **diminished residual fracture gaps** when treating subtrochanteric femoral fractures.
- Augmenting an intramedullary nail construct with additional cerclage wiring will confer **biomechanical advantages** to the final construct.



IF APPLIED CORRECTLY, THE
BIOMECHANICAL ADVANTAGES
OF CERCLAGE WIRING DO
SUPPLANT ITS NEGATIVE
BIOLOGICAL EFFECTS.

What implant and how ?



Cable vs wire

Efficacy of Minimally Invasive Reduction With Cerclage Fixation in Spiral or Oblique Subtrochanteric Femoral Fractures: A Retrospective Cohort Study Comparing Cables and Wires

Kook, Incheol; Park, Ki-Chul; Kim, Keong Yoon; More

Journal of Orthopaedic Trauma. 38(3):160-167, March 2024.

TABLE 2. Radiographic and Clinical Outcomes of the Study Groups

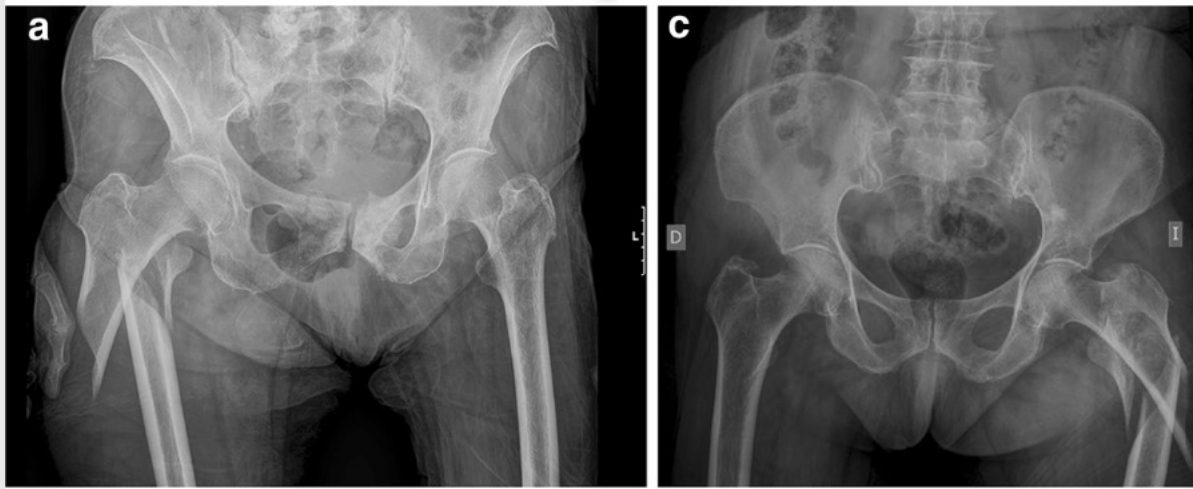
	Cable Group (n = 16)	Wire Group (n = 16)	Non-wiring Group (n = 14)	P
TAD (%)				0.860
<25 mm	14 (87.5)	13 (81.2)	13 (92.9)	
≥25 mm	2 (12.5)	3 (18.8)	1 (7.1)	
Interfragmentary gap (mm)				
Coronal	1.66 ± 1.63	4.80 ± 3.83	4.74 ± 1.85	0.003*
Sagittal	1.20 ± 1.72	4.42 ± 4.11	4.32 ± 2.61	0.003†
Neck–shaft angle (°)				
Contralateral	130.9 ± 4.6	130.3 ± 5.1	130.2 ± 3.3	0.893
Immediate postoperative	128.2 ± 4.9	129.8 ± 4.9	127.9 ± 4.0	0.467
Final follow-up	125.8 ± 4.3	126.3 ± 3.8	125.4 ± 3.7	0.801
Varus reduction (>5°)‡ (%)	2 (12.5)	3 (18.8)	2 (14.3)	1.000
Sagittal angulation (°)				
Immediate postoperative	5.3 ± 1.9	5.7 ± 3.0	6.3 ± 2.3	0.514
Final follow-up	5.7 ± 2.3	6.9 ± 3.2	8.2 ± 3.0	0.079
Significant change§ (%)				
Neck–shaft angle (>5°)	1 (6.3)	3 (18.8)	3 (21.4)	0.592
Sagittal angulation (>5°)	0 (0)	2 (12.5)	4 (28.6)	0.062
Union (%)	16 (100)	16 (100)	14 (100)	1.000
Delayed union (%)	0 (0)	5 (31.3)	4 (28.6)	0.034¶
Nonunion (%)	0 (0)	0 (0)	0 (0)	—
Time to union (wk)	13.8 ± 3.1	19.4 ± 4.0	22.7 ± 3.8	<0.001
6-mo RUSH score	28.5 ± 1.5	25.2 ± 3.7	23.7 ± 2.5	<0.001#

Better results with wires than solid cables

- Smaller interfragmentary gap
- Shorter union time
- Higher 6-month RUSH score

If your fracture pattern is good for a cerclage and you are thinking about it ...

... just do it !



Thank you for your attention

ANNUAL CONGRESS BOTA
..... 5 October 2024



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THE DATE**

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